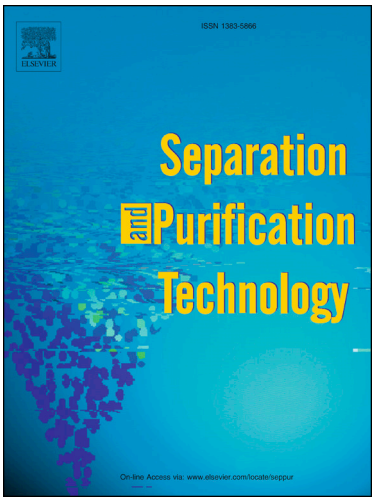

Recovery of nitric acid from effluent streams using solvent extraction with TBP: a comparative study in absence and presence of metal nitrates

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Recovery of nitric acid from effluent streams using solvent extraction with TBP: a comparative study in absence and presence of metal nitrates

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Abstract: In the present study, the extraction and recovery behavior of nitric acid with tri-butyl phosphate (TBP) has been investigated from the effluent streams. In which, the effect exhibited by the presence of metal (Na^+, Ca^{2+} and Mg^{2+}) nitrates has also been compared with that of the extraction and stripping behavior in absence of metal nitrates. The comparative study on parametric influence showed a higher acid removal in presence of additional metal nitrates in aqueous solution. The variation of TBP and nitrate ion concentration clearly demonstrated their influence on acid extraction and revealed the formation of $TBP{\cdot}HNO_3$ adduct nearly at 1:1 ratio, yielding equilibrium constant ($\log K_{ext.}$) values –0.428 and –0.316 in absence and presence of additional metal nitrates, respectively. The McCabe-Thiele plots indicated the requirement of four and two extraction-stages under counter-current flow for acid solutions in absence and presence of metal nitrates, respectively at a same phase ratio of 0.8:1. The maximum loaded organics in both conditions of aqueous feed were subsequently stripped with water, recovering (> 99%) nitric acid that can be reused. The acid removal from effluent stream is a sustainable process to control the nitrate discharge and limiting the consumption by its possible recovery and recycling.

Keywords: Nitric acid; Effluent treatment; Solvent extraction; Tri-butyl phosphate

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